days, and as ſoon as the laſt timber is placed, the centres may be removed, and each piece preſſing on its neighbour, will tend to render the whole compact; this being done, bolt down the belts C and D, diſtant from each other, in a lateral direction, about ten feet; then cover the whole with old ſail-cloth, or tarpawling, tar, and ſand; of the tar and ſand, two or three coats may be laid on, which will fill every apperture, and form a permanent cover to the total excluſion of the air and rain. The arch being thus covered and kept dry, would preſent a ſegment of a cylinder, at leaſt one foot thick, guarded from the change of ſeaſons, and in all probability would laſt many ages. The firſt ſegment being formed, proceed to raiſe the perpendiculars off the belts to ſupport the ſecond or upper ſegment; which ſegment ſhould be coated in like manner with tar, &c. previous to laying on the earth and gravel; which earth and gravel ſhould be, perhaps, eighteen inches thick, in order that wheels might never wear to the timbers or coating. Having deſcribed the conſtruction, and exhibited the formation, by the engraving, it is but neceſſary to obſerve, that the ſtaves compoſing the arch are not eat away by mortiſing, but preſerve their whole ſtrength; thus being joined like ſtaves, two ſides only of each ſtick is expoſed, which being coated, the whole of the timber is completely covered from the weather. I will now leave my reader to reflect on the ſtrength and durability of this arrangment; and then proceed to conſider to what extent of ſpan ſuch bridges may be conſtructed.

In this I muſt call to mind my former remarks, that the ſegment of a circle muſt be compreſſed into a ſtrait line, or ſink in one part and riſe in another, or the butments ſeparate before it is poſſible for a bridge to fall; by longitudinal preſſure, the lateral *tendency ſhall hereafter be obſerved*, admitting the above proportions; the queſtion is, Whether the arrangement of parts is ſo calculated as to guard againſt ſuch accidents? which probably will appear by the following conſiderations:

Firſt, the butments may be made to reſiſt any weight, by giving a greater weight of ſtone than there is weight of materials in the arch [*].

Second, the timbers being laid ſide by ſide, like ſtaves, and preſſing on each other, leave not the leaſt aperture into which the parts of mortiſed and framed timbers might be compreſſed; hence, ſeveral timbers, in a long arch, muſt abſolutely be compreſſed into nothing, before the ſegment could become a ſtrait line.

Third, that it may not vary its poſition, by ſinking in one part and riſing in another, with the various weights, I will conſider the ſtaves and belts only: it muſt be obſerved, that by bolting down the belts, which belts may be from thirty to forty feet long, and break joint, as in Fig. II. the whole arch will become like one ſolid piece of timber, bent between the piers. I will now ſuppoſe ſuch a bridge forty feet broad, the timbers combined eighteen inches thick; hence, admitting that it was conſtructed of wood as light as fir, each lineal foot would weigh one ton and a half, hence every thirty feet forward would weigh forty-five tons; as a waggon, when loaded, ſeldom weighs more than five tons [†].

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[*] Although this may not be neceſſary, it is certain; and as it is more my intention to exhihit the poſſibility of conſtructing bridges of a great ſpan, than to point out the preciſe proportion of the parts, I conceive, by ſhewing it poſſible, future deliberations of ingenious men will determine the proportion.

[†] By this I mean the broad-wheeled waggon of England, the American waggon is ſeldom more than three tons.

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